

Polarized optical properties of dust aerosols: lessons learned from modeling simulations and the Amsterdam–Granada laboratory measurements

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Accurate modeling the polarized optical properties of dust aerosols has always been challenging, primarily due to the complexity of dust aerosol morphologies and inhomogeneous compositions. This talk will discuss lessons learned from comparing the modeling results [1–3] and laboratory measurements from the Amsterdam-Granada Light Scattering database [4]. Specially, we used super-spheroids (smooth and roughened surfaces, homogeneous and inhomogeneous) to model the dust morphologies. The invariant imbedding T-matrix method (IITM) [5] and improved geometric-optics method (IGOM) were employed to compute the optical properties of super-spheroidal dust particles. The maxim size parameter for the T-matrix simulations is 100, although the size parameter for merging the IITM and IGOM results is sufficiently to obtain “accurate” size-averaged results around 40–50. The single-scattering properties of super-spheroids were then used to model the optical properties of 46 aerosol samples. Based on the extensive comparisons, we will show how the nonsphericity, inhomogeneity and surface roughness impact the performance of comparisons, particularly, for P_{12} , and P_{22} elements. The implication of the lessons learned from this study in polarized remote sensing applications will be also discussed. In addition, we will report on a new database of the single-scattering properties of dust aerosols.

References

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